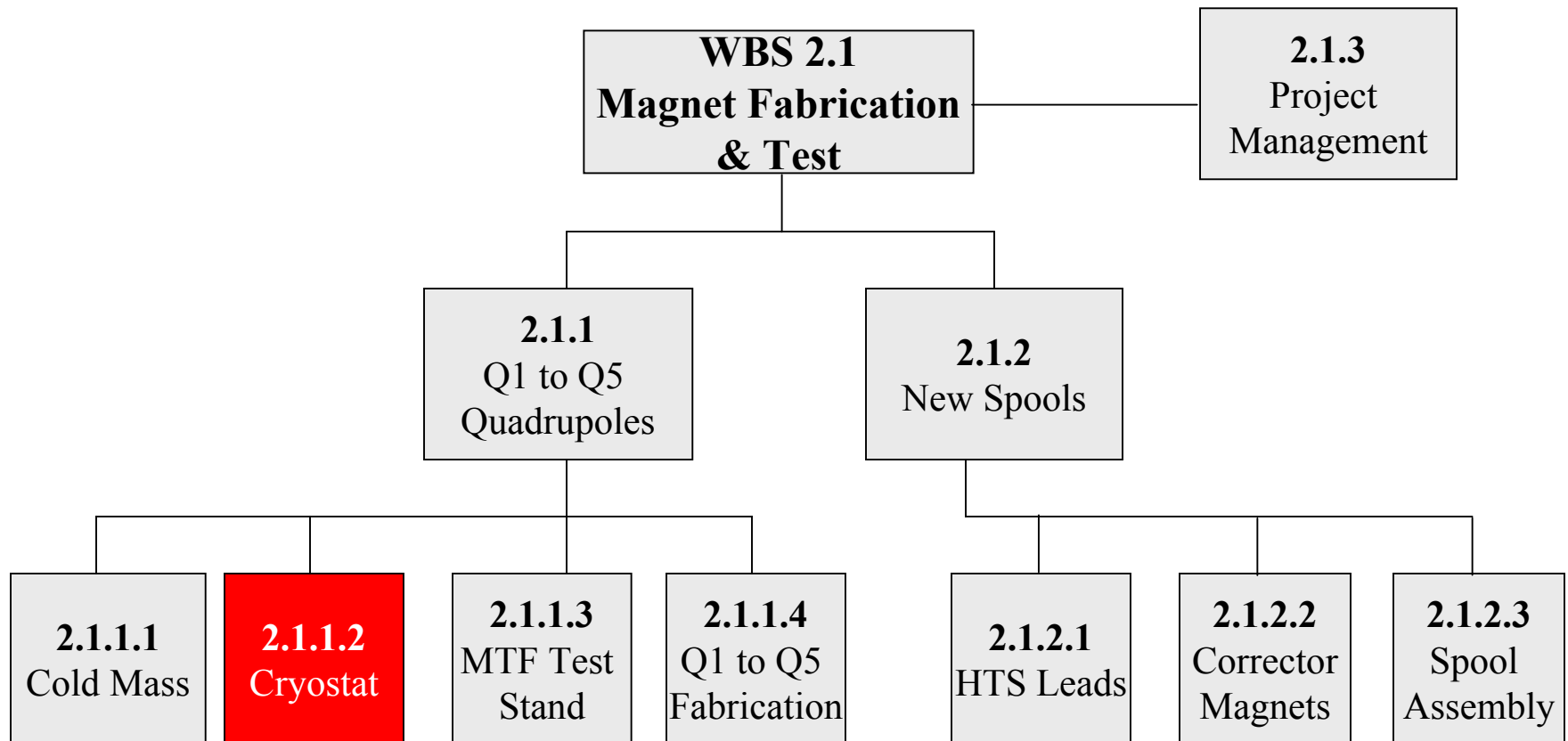
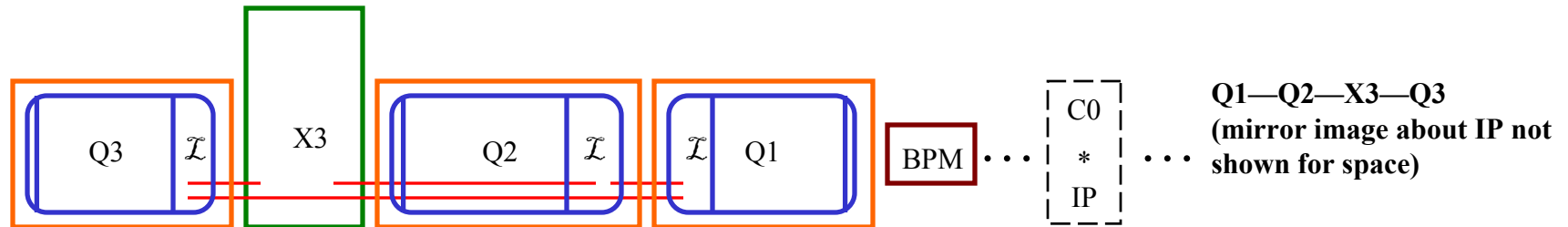


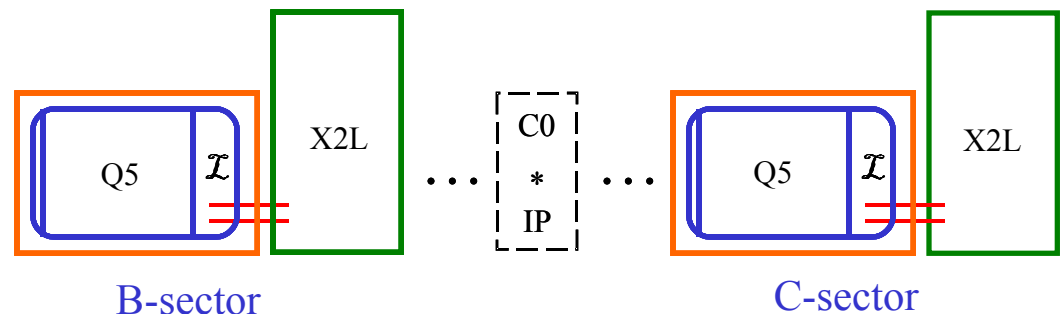
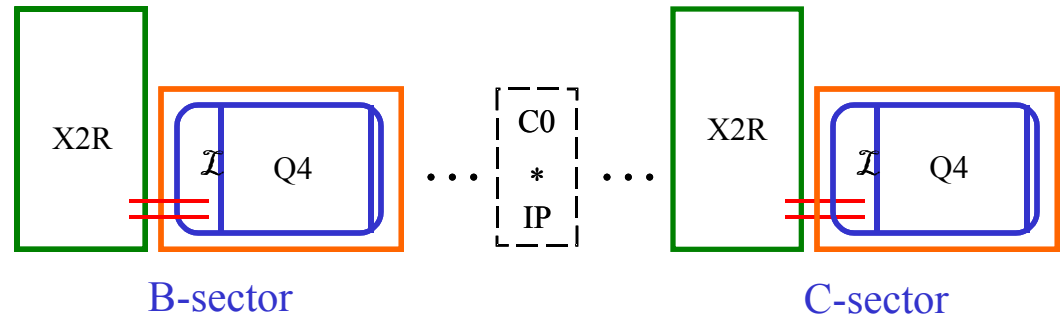
Interaction Region Quadrupole Cryostats (WBS 2.1.1.2)

Thomas H. Nicol





- Two triplets, Q1 through Q3 with one new spool, mirrored across the IP.
- Two new quadrupoles, Q4 and Q5 each with a new spool translated across the IP.



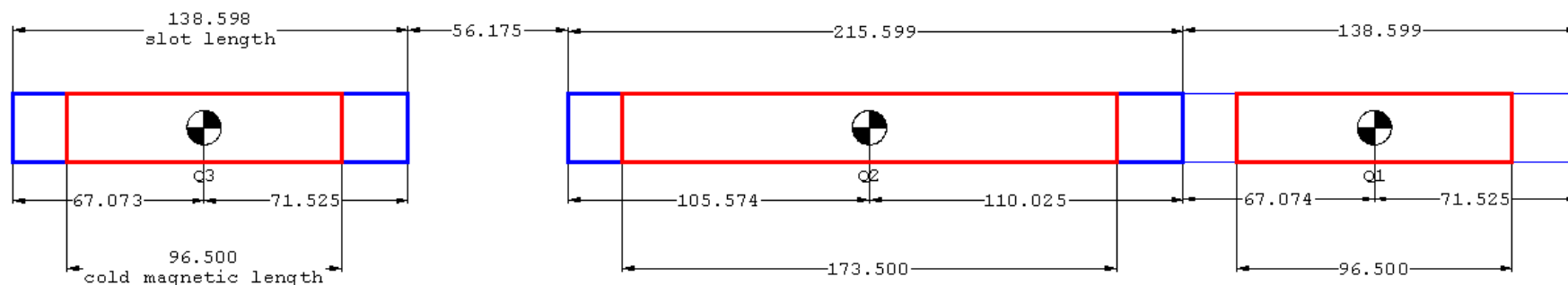
- Design and build two sets of IR quadrupole cryostats for magnets based on LHC collared coil assemblies plus one spare set (3 total).
- Each set consists of 5 quadrupoles, Q1 through Q5, i.e. 15 cryostats total – including 5 spares.

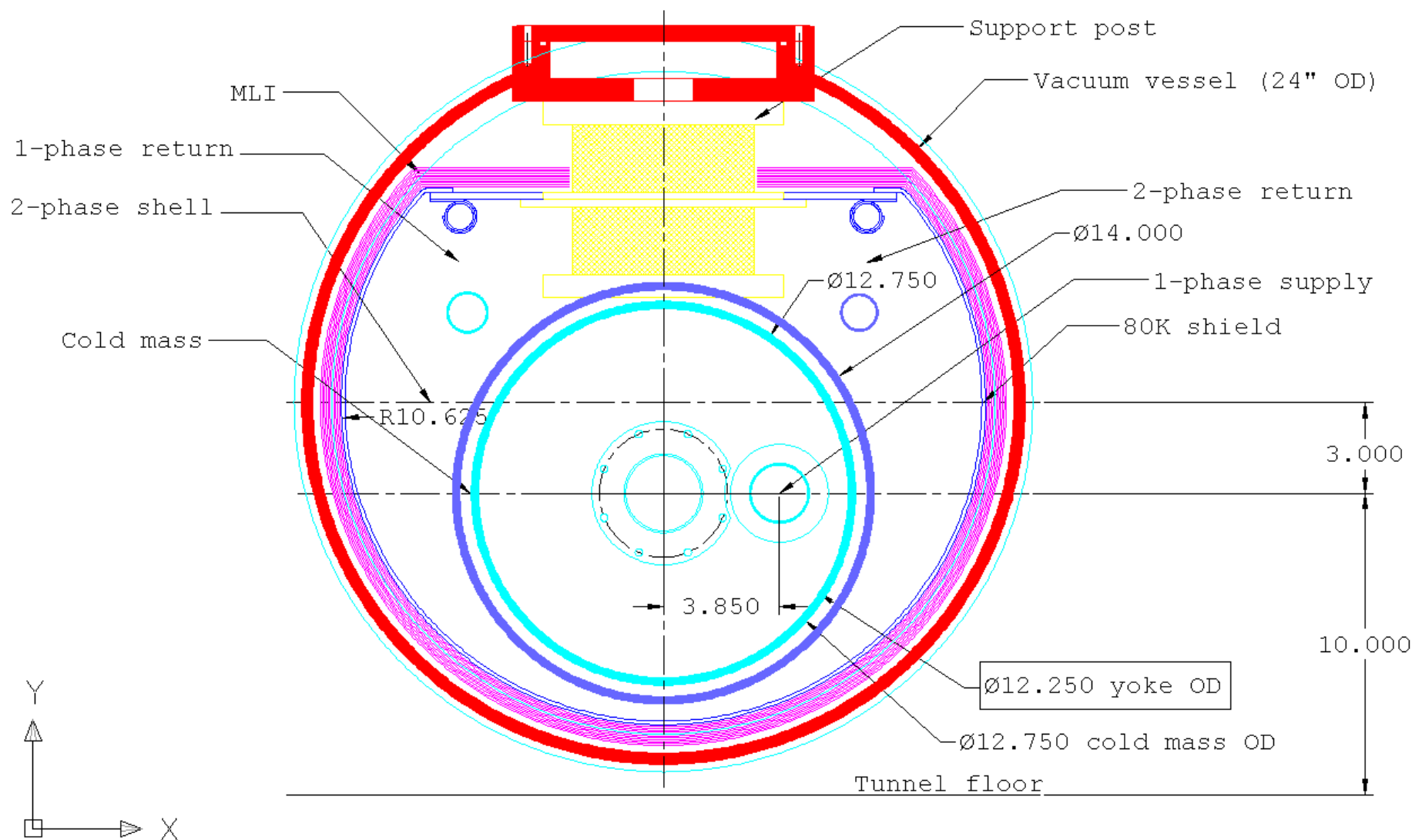
	Warm magnetic length*	Overall coil length*	Interconnect configuration	Actual slot length**
Q1	96.80	100.57	Tevatron cryo plus single phase, two phase, and shield returns.	138.60
Q2	174.00	177.81	Tevatron cryo plus single phase, two phase, and shield returns.	215.60
Q3	96.80	100.57	Tevatron cryo plus single phase, two phase, and shield returns.	138.60
Q4	79.20	83.01	Tevatron (at least one end).	117.10
Q5	54.20	57.94	Tevatron (at least one end).	96.10

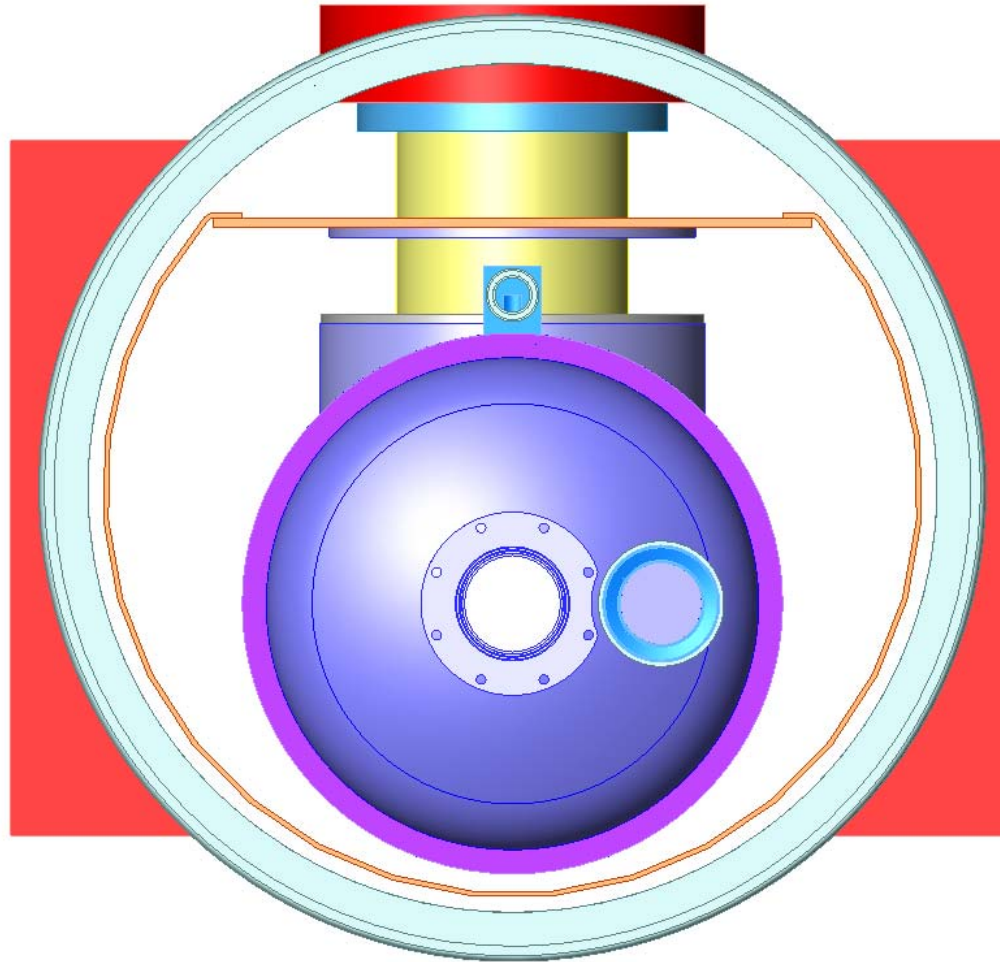
*: From Fred Nobrega

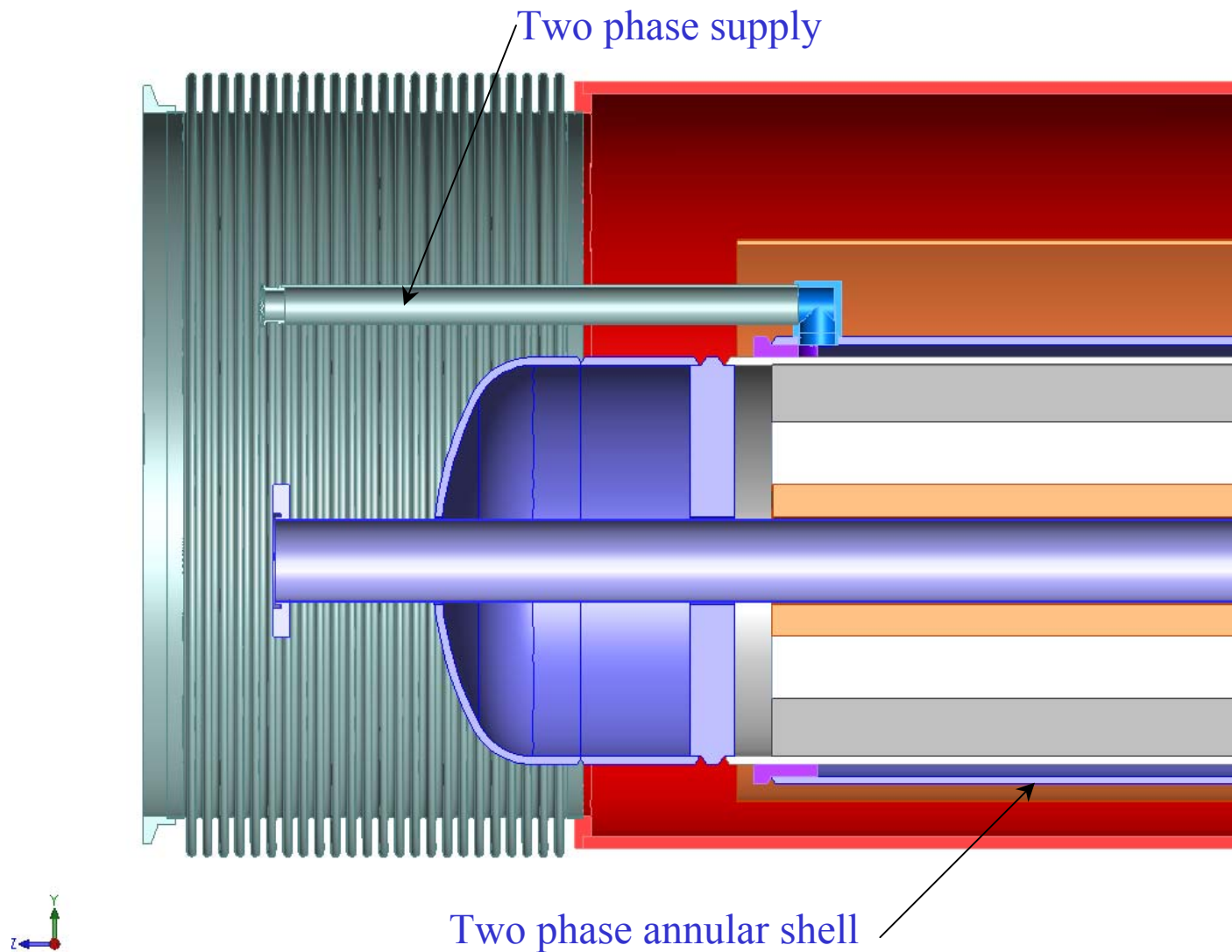
** : From lattice

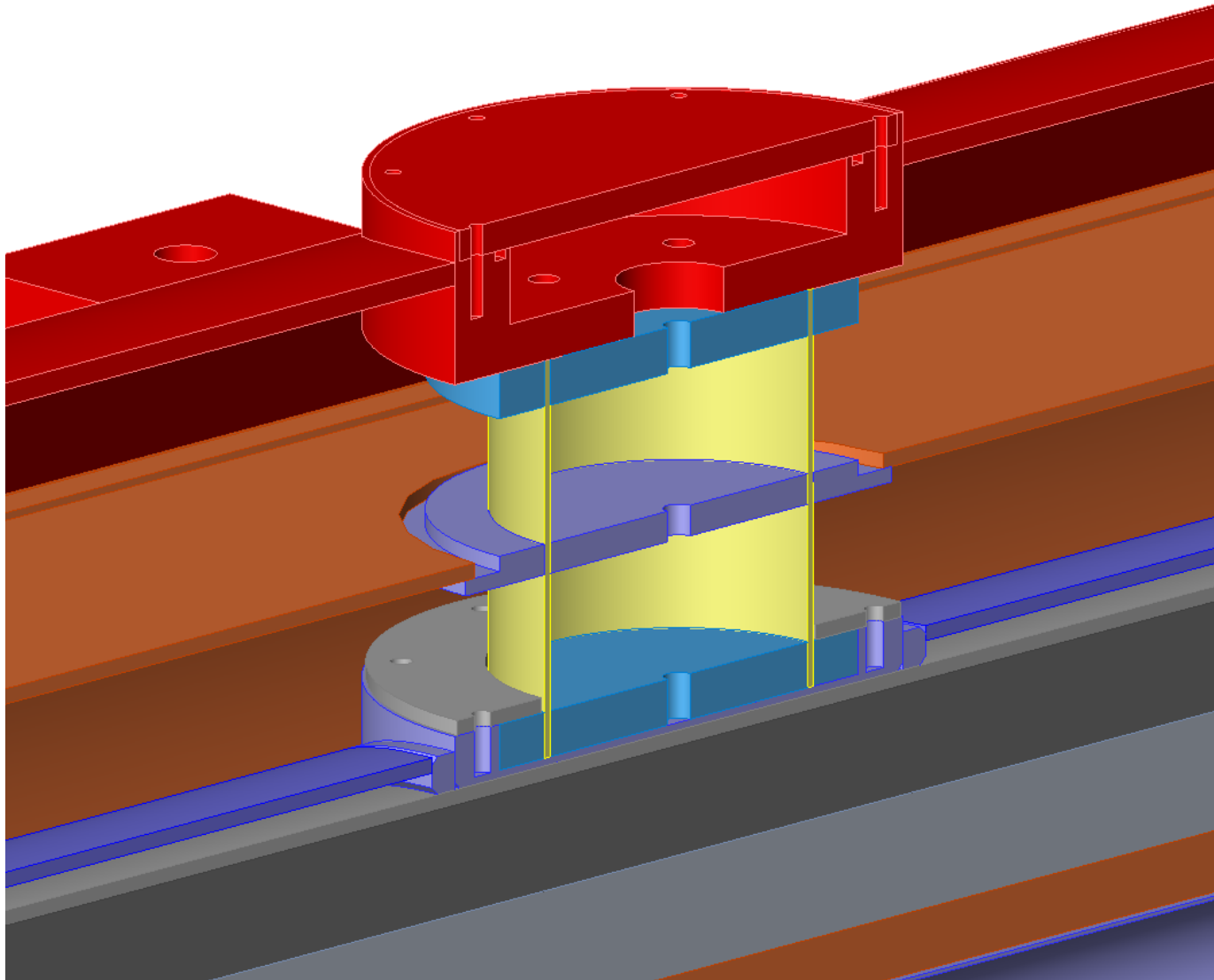
- Designed in accordance with the ASME Boiler and Pressure Vessel Code.
- Design maximum allowable working pressure (MAWP):
 - Single phase: 200 psi
 - Two phase: 50 psi
 - LN₂ shield: 100 psi
- Heat load to 4K:
 - 5 W per device (quad, spool, etc.)
- Operating pressures:
 - Single phase: 16 psig
 - Two phase: 5 psig

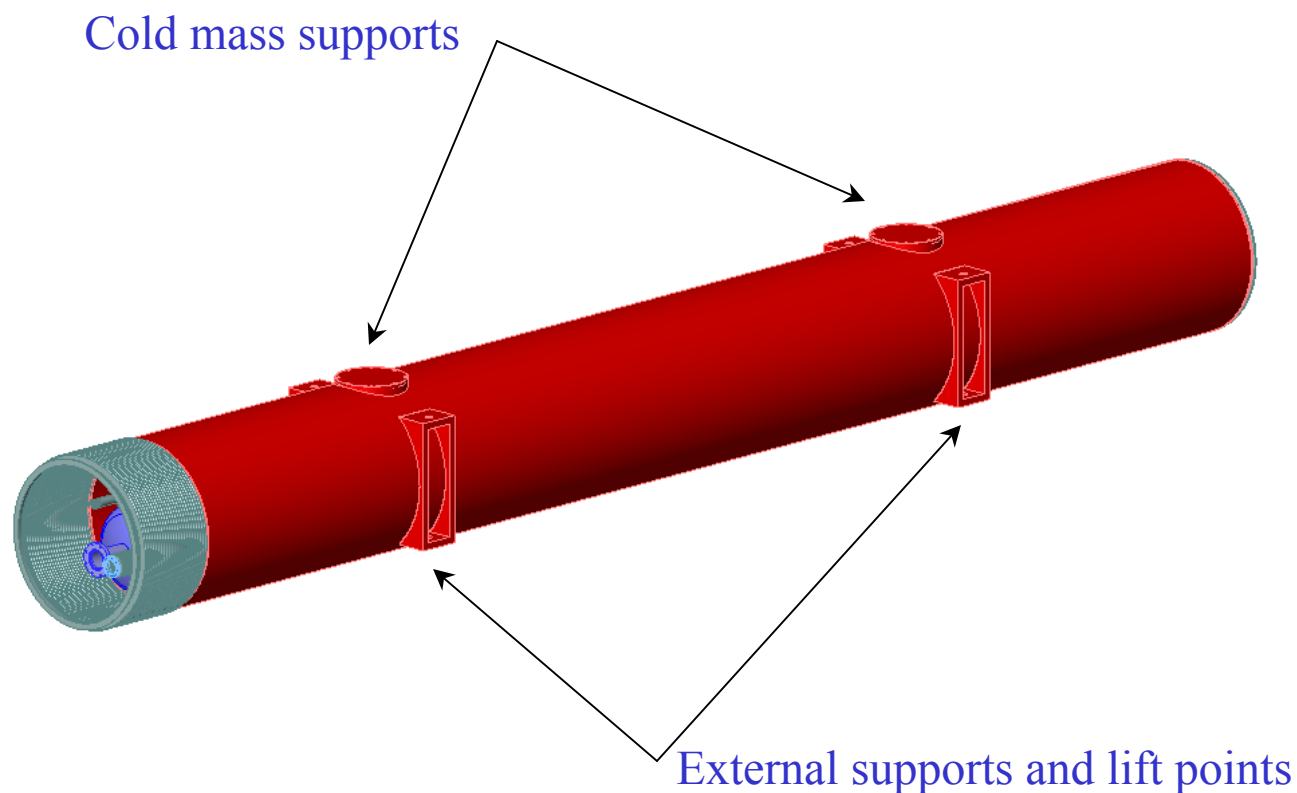






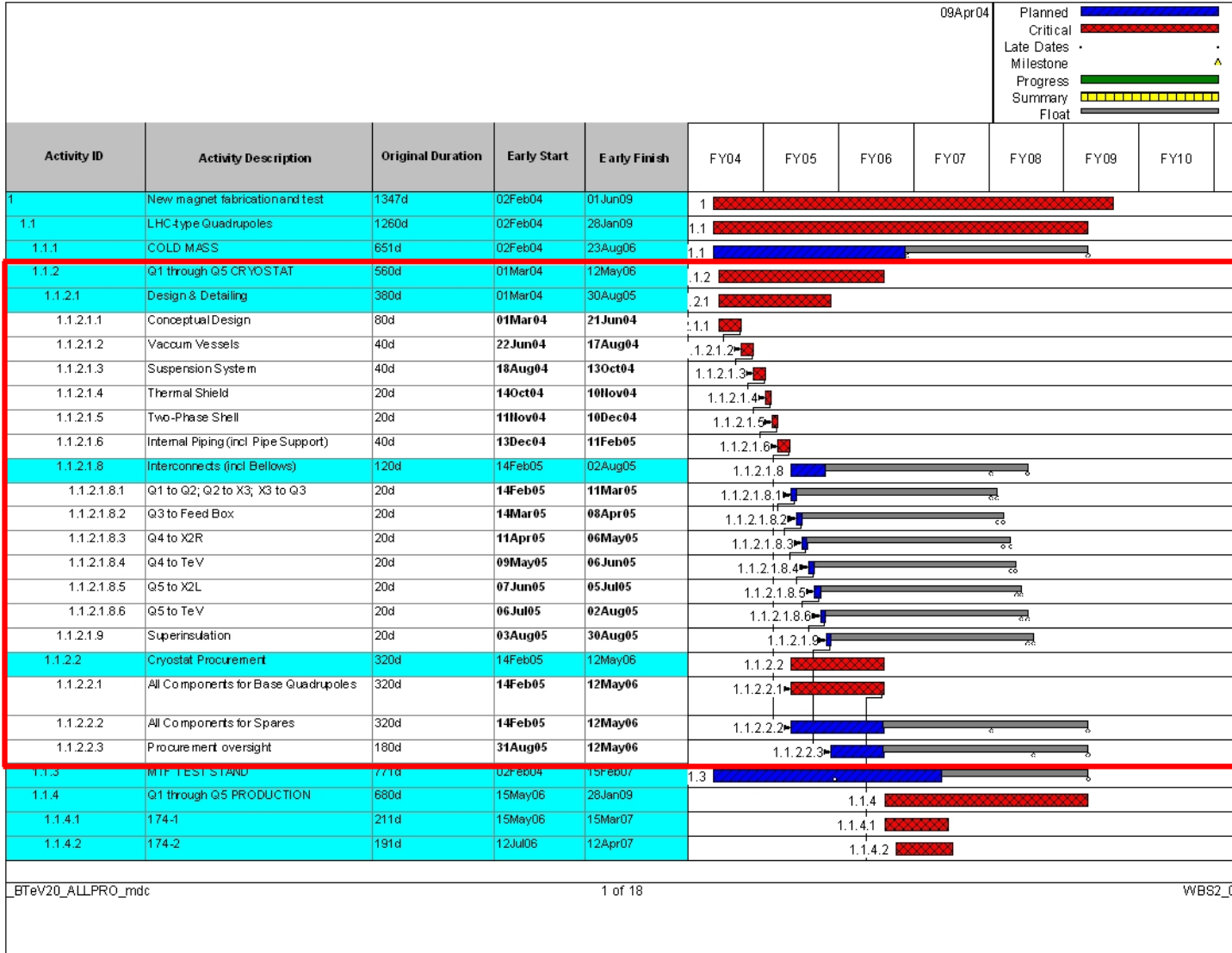


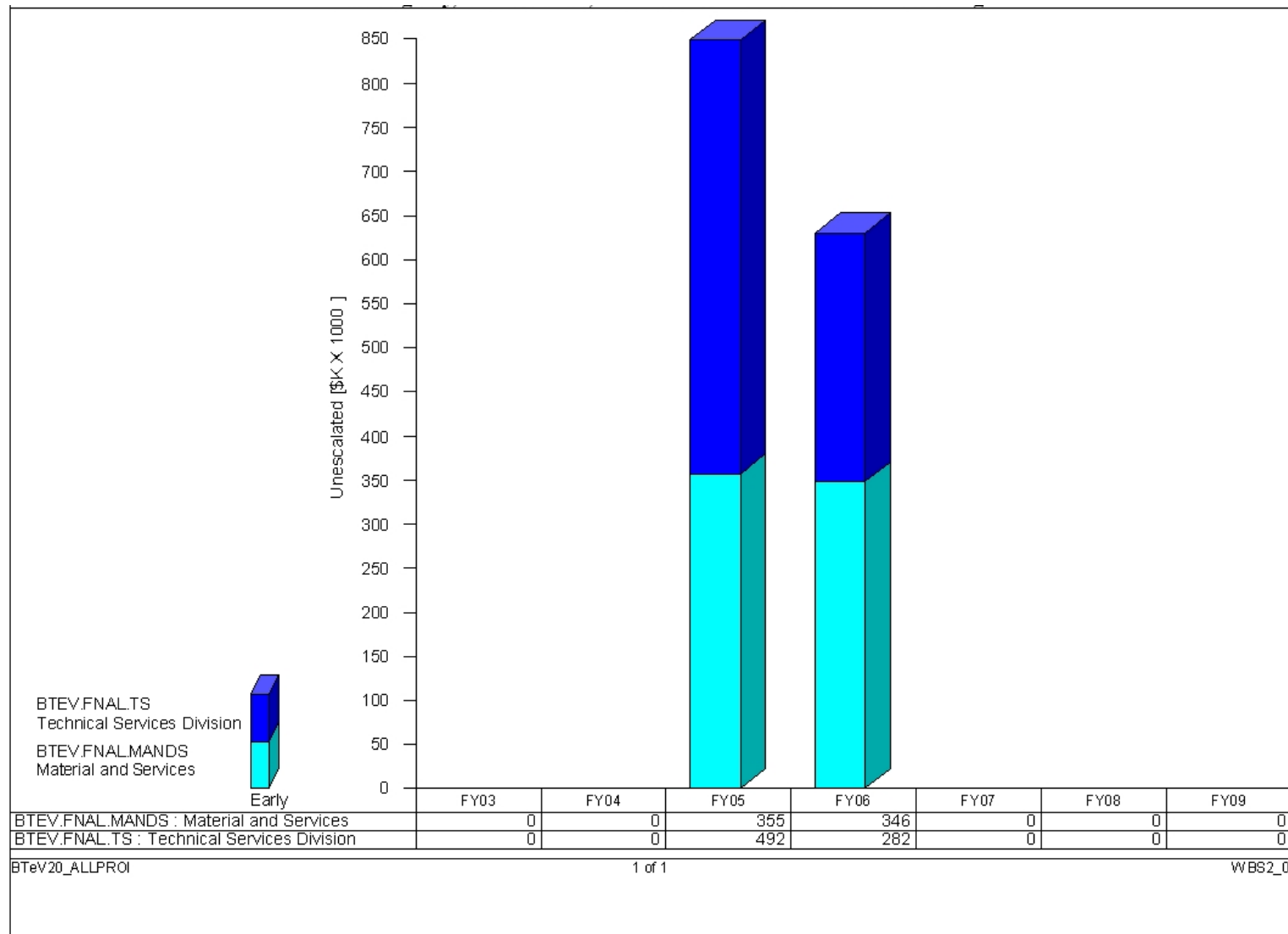


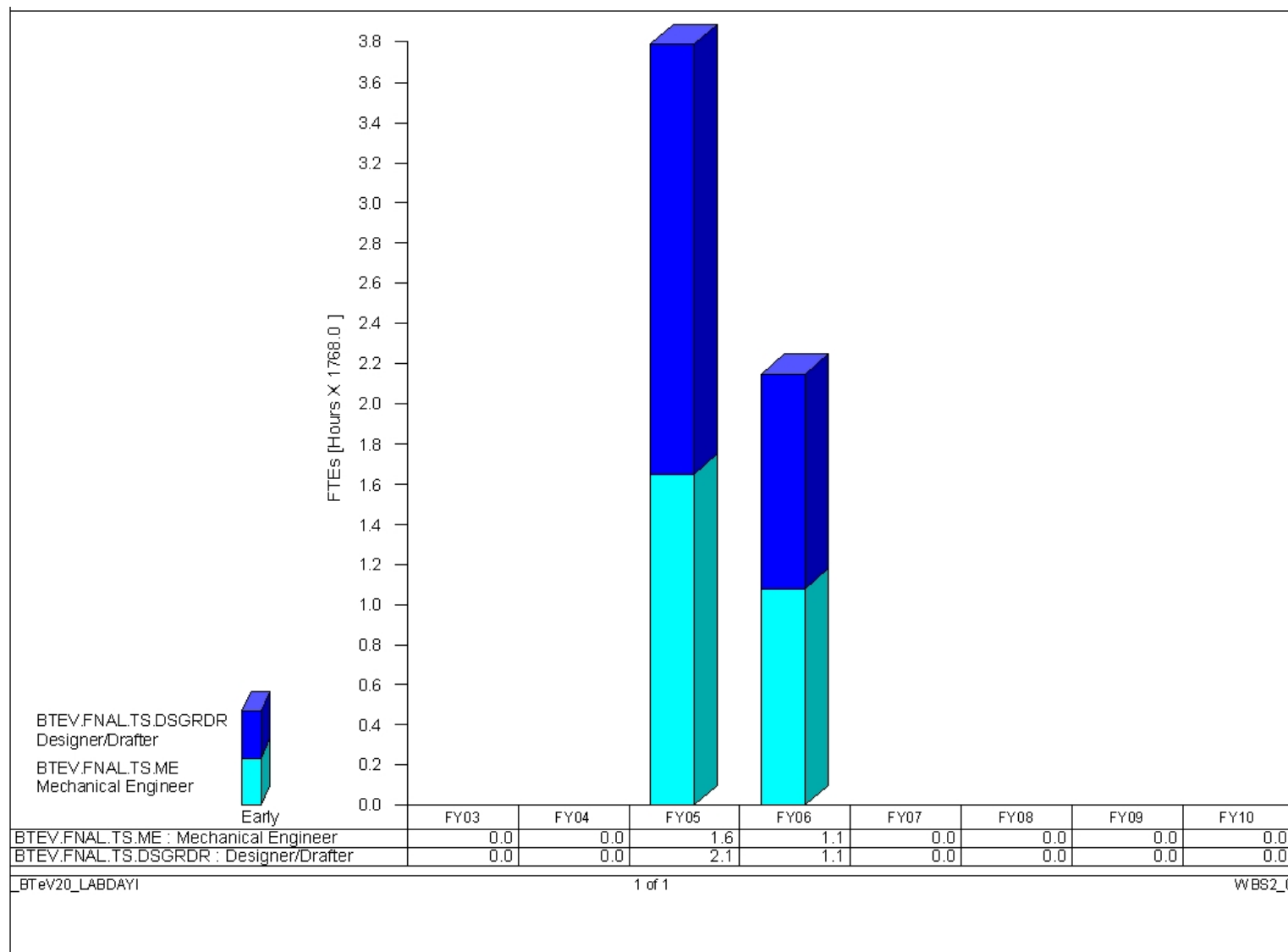


- Complete conceptual design – June 2004.
- Place order for vacuum vessels – February 2005.
- Begin production of first cryostated magnet – August 2006.

- Conceptual design completion.
- Vacuum vessel order placement.
- Start of production.







- Schedule:
 - Conceptual design: March 2004 – June 2004
 - Detailed design (including interconnects): June 2004 – August 2005
 - Procurement: February 2005 – May 2006
- Engineering, design, and parts procurement costs:
 - M&S: \$701K (all in FY05 and 06, does not include spares)
 - EDIA: \$774K (all in FY05 and 06, includes procurement oversight)
- Engineering and design manpower requirements:
 - Engineers: 1.6 FTEs in FY05, 1.1 in FY06
 - Designers and drafters: 2.1 FTEs in FY05, 1.1 in FY06
 - Ongoing effort after FY06 is part of the production effort

Risk

- Insufficient resources applied to engineering and design drafting early in the design phase.
- Suspension system not adequate.

Mitigation

- Define and allocate resources during conceptual design phase.
- Include prototype testing in early detailed design phase.

- The cryostat design is a straightforward extrapolation of similar work on the Tevatron, SSC, TESLA, and LHC projects.
- Cost estimates are based on detailed, parts-level estimates made for LHC cryostats adjusted for design differences.
- Resources are in place and already involved in the BTeV quadrupole cryostat conceptual design effort.
- Experienced staff in:
 - Engineering
 - Procurement
 - Production
 - Test